

§ 25.391

speeds and corresponding device positions that the mechanism allows.

[Doc. No. 5066, 29 FR 18291, Dec. 24, 1964, as amended by Amdt. 25-72, 55 FR 29776, July 20, 1990; Amdt. 25-86, 61 FR 5222, Feb. 9, 1996]

CONTROL SURFACE AND SYSTEM LOADS

§ 25.391 Control surface loads: General.

The control surfaces must be designed for the limit loads resulting from the flight conditions in §§ 25.331, 25.341(a), 25.349 and 25.351 and the ground gust conditions in § 25.415, considering the requirements for—

- (a) Loads parallel to hinge line, in § 25.393;
- (b) Pilot effort effects, in § 25.397;
- (c) Trim tab effects, in § 25.407;
- (d) Unsymmetrical loads, in § 25.427; and
- (e) Auxiliary aerodynamic surfaces, in § 25.445.

[Doc. No. 5066, 29 FR 18291, Dec. 24, 1964, as amended by Amdt. 25-86, 61 FR 5222, Feb. 9, 1996]

§ 25.393 Loads parallel to hinge line.

(a) Control surfaces and supporting hinge brackets must be designed for inertia loads acting parallel to the hinge line.

(b) In the absence of more rational data, the inertia loads may be assumed to be equal to KW , where—

- (1) $K=24$ for vertical surfaces;
- (2) $K=12$ for horizontal surfaces; and
- (3) W =weight of the movable surfaces.

§ 25.395 Control system.

(a) Longitudinal, lateral, directional, and drag control system and their supporting structures must be designed for loads corresponding to 125 percent of the computed hinge moments of the movable control surface in the conditions prescribed in § 25.391.

(b) The system limit loads, except the loads resulting from ground gusts, need not exceed the loads that can be produced by the pilot (or pilots) and by automatic or power devices operating the controls.

(c) The loads must not be less than those resulting from application of the

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minimum forces prescribed in § 25.397(c).

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§ 25.397 Control system loads.

(a) *General.* The maximum and minimum pilot forces, specified in paragraph (c) of this section, are assumed to act at the appropriate control grips or pads (in a manner simulating flight conditions) and to be reacted at the attachment of the control system to the control surface horn.

(b) *Pilot effort effects.* In the control surface flight loading condition, the air loads on movable surfaces and the corresponding deflections need not exceed those that would result in flight from the application of any pilot force within the ranges specified in paragraph (c) of this section. Two-thirds of the maximum values specified for the aileron and elevator may be used if control surface hinge moments are based on reliable data. In applying this criterion, the effects of servo mechanisms, tabs, and automatic pilot systems, must be considered.

(c) *Limit pilot forces and torques.* The limit pilot forces and torques are as follows:

| Control | Maximum forces or torques | Minimum forces or torques |
|--|-------------------------------|---------------------------|
| Aileron: | | |
| Stick | 100 lbs | 40 lbs. |
| Wheel ¹ | 80 D in.-lbs ² ... | 40 D in.-lbs. |
| Elevator: | | |
| Stick | 250 lbs | 100 lbs. |
| Wheel (symmetrical) | 300 lbs | 100 lbs. |
| Wheel (unsymmetrical) ³ | | 100 lbs. |
| Rudder | 300 lbs | 130 lbs. |

¹ The critical parts of the aileron control system must be designed for a single tangential force with a limit value equal to 1.25 times the couple force determined from these criteria.

² D=wheel diameter (inches).

³ The unsymmetrical forces must be applied at one of the normal handgrip points on the periphery of the control wheel.

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§ 25.399 Dual control system.

(a) Each dual control system must be designed for the pilots operating in opposition, using individual pilot forces not less than—

- (1) 0.75 times those obtained under § 25.395; or